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EP Act Budget Proposal

Briefing for Margo
May 2, 2007

EPAct Budget Plan Areas

1. Fuel Effects Testing & Modeling
2. Lifecycle Analysis Strategy
 1. Data Development & Studies
 2. Tool Development
3. RFS Implementation & Surveys

EPAct Budget Proposal Summary

| | 2007 | 2008 |
|---|----------------|---------------|
| Fuel Effects Testing (ASD) | \$4.7M | \$2.0M |
| Lifecycle Data & Tool Development (TCD/ASD) | \$2.25M | \$1.0M |
| RFS Implementation & Surveys (CISD) | \$1.5M | \$3.0M |
| RFS Printing, Aircraft Study (ASD) | \$0.2M | - |
| TOTAL | \$8.65M | \$6.0M |

Fuel Effects Testing

Drivers for Data Needs

- OTAQ Core Mission: we need this data to be able to forecast impact of future fuel & vehicle control programs
- Will provide fuel effects models for use in MOVES
 - Fill the gaps in Tier 2 LDV/T and Nonroad Engines
 - Fill the gap in PM data
- Currently no ability to confidently quantify the future impacts of ethanol, RVP, etc.

Drivers for Data Needs (Cont.)

- MOVES can then be used for quantifying the emission impacts of fuel changes for:
 - Any new AFS standards
 - ✓ Replace the assumptions used for RFS
 - ✓ Will not be able to take any regulatory action without improved data unless (as for RFS) the market would do it anyway
 - Any new fuel regulations in response to increases in ethanol use (e.g., removal of the 1 psi waiver for ethanol)
 - Evaluation of both Legislative and Policy options
- Will also feed into:
 - EPA Act mandated studies (1509 Fuel Harmonization Study, 1506 Anti-backsliding Study) should they be carried out
 - New State SIP emission inventories and air quality assessments

Assessing the Scope of This Effort

- The complex model development cost in excess of \$30 M (in \$1993)
 - Relatively narrow purpose was to certify RFG
- Now we need to understand fuel effects:
 - Highway and Nonroad
 - Gasoline and Diesel
 - LDV/Ts and HDV (new technologies)
 - Summer and Winter
 - VOC, NOx CO, but also PM and Toxics
 - Exhaust, evap, permeation
- Potential benefits of a fuel modification must be quantified before any regulatory action can occur

Fuel Testing Strategy

Separate but overlapping programs to address:

- LD exhaust w/ focus on Tier 2
- Nonroad exhaust & evap
- LD evap
- If resources available: Diesel fuel effects

Fuel Testing: Light Duty Exhaust (\$4.2 M)

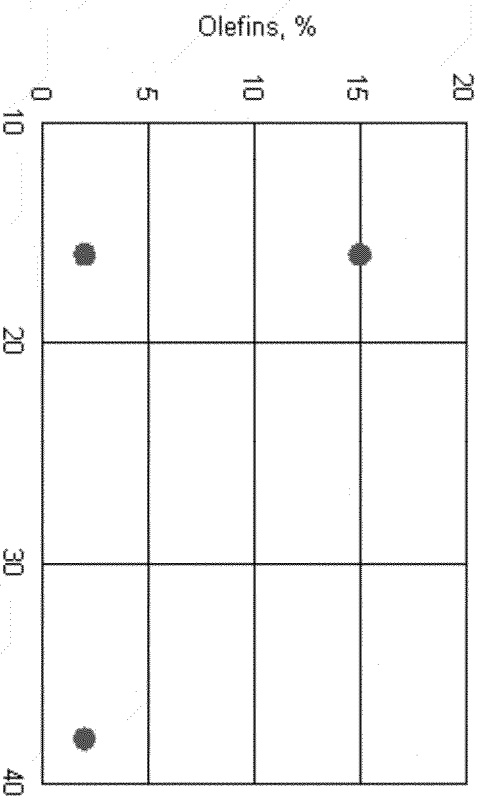
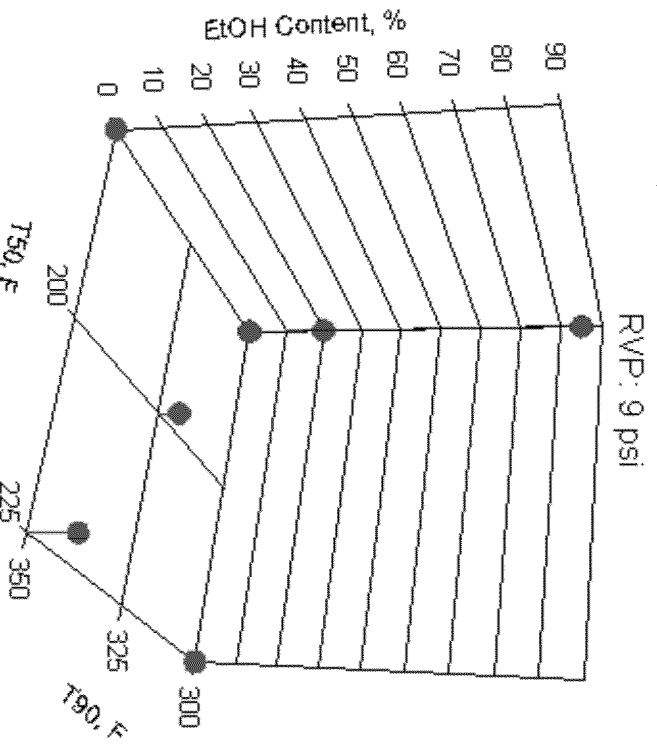
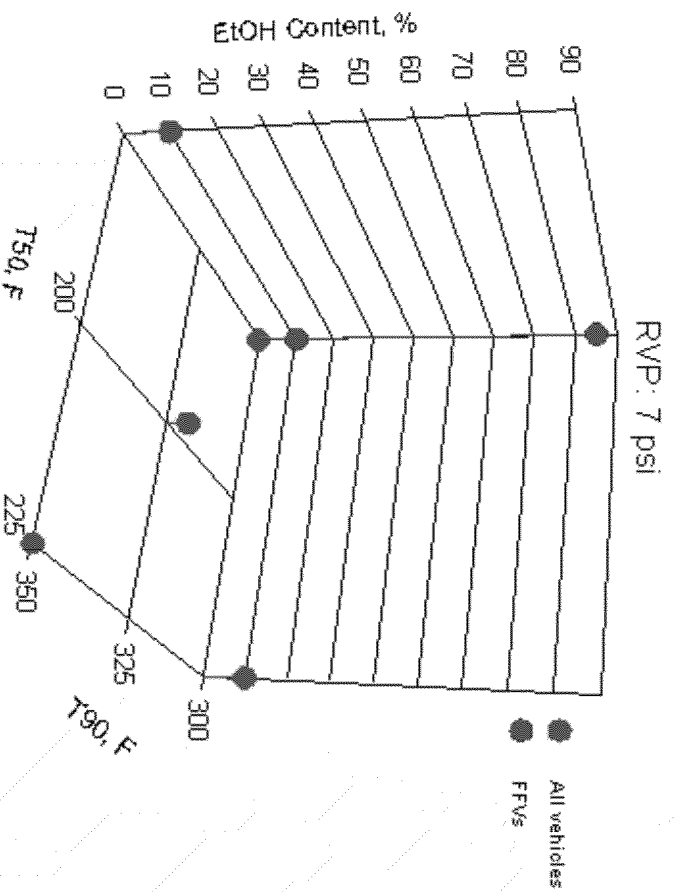
- Fill data gap on effects of selected fuel parameters on Tier 2 vehicles
 - Fills out recent testing work by CRC and in MSAT rule
 - 18 vehicles, including some FFVs
 - 17 fuels
 - ✓ To determine effects and interactions of EtOH, RVP, Aromatics, Olefins and T50/T90
 - Gather PM and toxics
 - Include some testing at 50 deg
- What this test program doesn't get us...
 - Sulfur effects on Tier 2 vehicles
 - Cold temperature testing (20 deg)
 - Small changes in emissions (less than 5-10%)
 - Nonlinear fuel effects

Fuel Effects Covered in Light Duty Exhaust Program

| Clear Effect | Less Clear | Not Tested |
|--------------|------------|--------------|
| Ethanol | T50 / T90 | Sulfur |
| RVP | Aromatics | Detergents |
| Test Temp | Olefins | Winter temps |

- Moving T50/T90 into “Clear Effect” box would require an additional Ex. 4 - CBI
- Any other parameter by itself would cost Ex. 4 - CBI

Light Duty Exhaust Program Fuel Matrix



Main program – 7 psi and 9 psi RVP levels

- Number of base fuels designed (0% EtOH, 7 psi RVP): 8 (5*)
- Number of test fuels blended: 17 (14*)

Note: Butane addition used to achieve RVP level of 9 psi from baseline level of 7 psi

* w/o aromatics and olefins

Fuel Testing: Nonroad Gasoline (\$1M)

- Fill data gap on effects of RVP and EtOH on nonroad gasoline engines
 - Undertaking 8 engine study on EtOH (already funded)
 - ARB study is undertaking a 12 engine study; we would add money to add engines and PM data collection
 - Would also pursue testing on catalyst-equipped engines either through ARB or separate contract
- Still a limited program...
 - Small subset of equipment types & models
 - Only looking at EtOH and RVP effects
 - Only large emission impacts will be quantifiable due to limited size of the test program

Fuel Testing: Light Duty Evap (\$1.5M)

- Characterize evap “leaker” rate **Ex. 4 - CBI**
 - with new technology most emissions will be produced by vapor or fuel leaks, so need to understand how often they occur
 - 1000 in-use vehicles checked for high vapor emissions
- Fill data gap on effects of RVP and EtOH on enhanced/near zero evap vehicles **Ex. 4 - CBI**
 - 15 vehicles
 - 4 fuels – 2 RVP levels, 2 EtOH levels
 - Supplements CRC testing underway on 8 vehicle
- What this doesn’t get us...
 - Evaluation of fuel effects vs. failure mode for leakers

What will be produced....

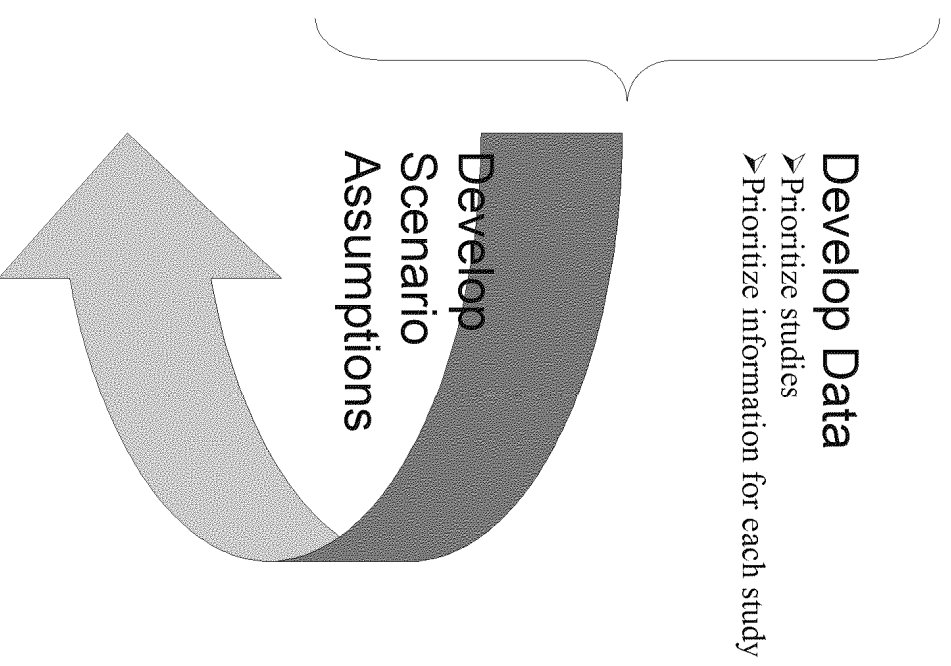
The data will be used to develop an up-to-date fuel effects model, which feeds:

- MOVES
 - ✓ SIP, Inventory and Air Quality analyses
- New regulatory programs (e.g. AFS)
- Legislative and policy options
- EPAAct requirements
 - ✓ Anti-Backsliding study
 - ✓ Fuel Harmonization study

Life Cycle Analysis Plan

Life Cycle Analysis Plan

- Understand fuel and resource characteristics
 - Technical potential
 - Process modeling
 - Costs per gallon
 - Environmental impacts per gallon
- Understand infrastructure
 - How far is fuel transported
 - Where is it used
 - Modes of transportation
- Understand vehicles
 - Types of vehicles / technologies used, when
- Develop tools used for analysis
 - Scenario / pathway evaluation (short term)
 - ✓ Fixed volumes of specific fuels
 - Economic choice (longer term)
 - ✓ Fixed parameters and model decides fuels



Life Cycle Analysis: Data Development

Understand Fuel and Resource

Characteristics: Agricultural Sector (\$0.5M)

- Capture land use changes and agricultural sector impacts *domestically* and *internationally*
 - Direct Inputs
 - ✓ Amount of fertilizer, chemicals, and fuel used
 - ✓ Yields
 - ✓ N₂O related to fertilizer input, biologically fixed N (e.g., soybeans), and crop residue
 - ✓ Regional differences, land use differences (e.g., CRP land)
 - Secondary effects
 - ✓ GHG related to livestock management (enteric fermentation, herd size, feed quality, manure management, etc.)
 - ✓ Soil carbon change (land use, cropping patterns, energy crops, etc.)
 - ✓ Water use
 - ✓ Nutrient runoff
 - ✓ Soil erosion
- Investigate how these factors will change over time

Understand Fuel and Resource

Characteristics: Fuels Production (\$1.4M)

→ Process Modeling

- What type of feedstock
- What type of plant
- What size plant
- Yields
- Energy use / efficiency
- Type of energy use
- Carbon capture and sequestration issues (where applicable)
- Co-products use
- Emissions

→ Economics

- Capital cost
- Labor cost
- Feedstock costs
- Ancillary costs
- Energy costs
- Carbon capture and sequestration costs (where applicable)
- Co-product prices

→ Understand how these change over time



Several pathways depending on which assumptions are chosen

Assess Refining and Distribution (\$0.25M)

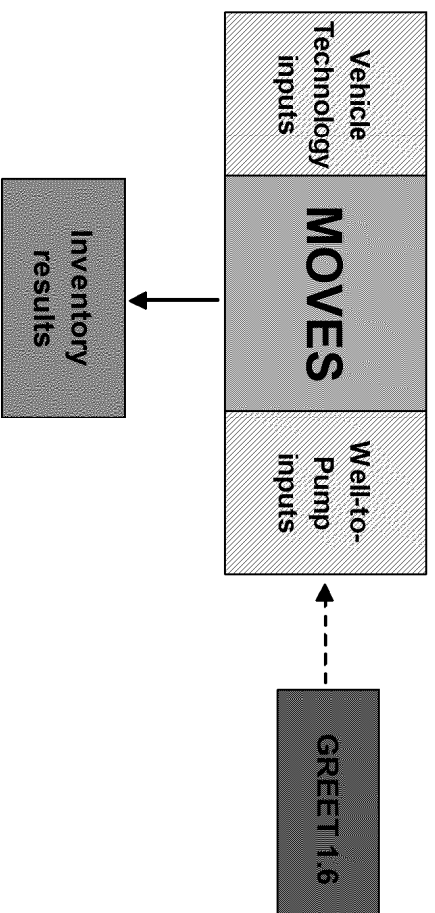
- Renewable fuel distribution infrastructure
 - Capital Costs
 - Leadtime
 - Efficiency and energy use
 - Emissions
- Impact on Petroleum Refining and Distribution
 - Impacts on gasoline and diesel quality
 - Impacts on petroleum refinery and distribution system investments
 - Offsetting impacts on petroleum refining and distribution system growth
- Wide range of possible scenarios – function of alternative fuel type, volume and source

Life Cycle Analysis: Tool Development

Overview

- Results of independent data development studies feed into modeling tools
- Short term - scenario analysis tool based on fuel volumes (Assumptions Development)
 - What mix of fuels to analyze
 - What mix of pathways
 - ✓ Where are current plants located
 - ✓ Where is feedstock production located
 - ✓ What are modes of transportation
 - Current situation vs. projections for all these
- Longer term - economic choice model
 - Decisions on type of fuel / process determined by model
- No one tool to fit all of our needs

Starting Point: MOVES / GREET



What they do:

- MOVES will calculate criteria pollutants for mix of vehicles and fuels
- GREET estimates lifecycle (“well-to-wheel”) energy and emissions per gallon of fuel used for an average vehicle for conventional and some alternative fuels
 - GREET per-vehicle approach means it cannot model vehicle/fuel scenarios
- MOVES will calculate “well-to-pump” GHG emissions based on factors from GREET or another source
 - DOE/Argonne and EPA collaborated in 2004-5 to create an interface between GREET and MOVES

Advantages:

- Links well-to-pump effects to our best estimates of on-road “pump-to-wheel” emissions
- Generates total inventory
- Allows broader scenario analysis, e.g. vehicle penetration

Limitations:

- Only as good as well-to-pump inputs
- Does not help define what optimal inputs for policy questions
- No connection to related analyses (e.g. energy security, supply/demand)

Up to this point OTAQ has primarily relied on GREET for lifecycle modeling

- GREET used in RFS rule

Agricultural Sector Models (\$0.3M)

What they do:

- Provide inputs to other models, GHG impacts from domestic and international agricultural sector, cost curves for biofuel feedstocks

Limitations:

- Limited information of fuels markets
- Limited interactions with other sectors

Up to this point OTAQ has primarily relied on FASOM for domestic agricultural sector modeling

Developing capacity with an international model (focus on Brazil initially)

Policy Analysis Tools (\$0.6M)

What it does:

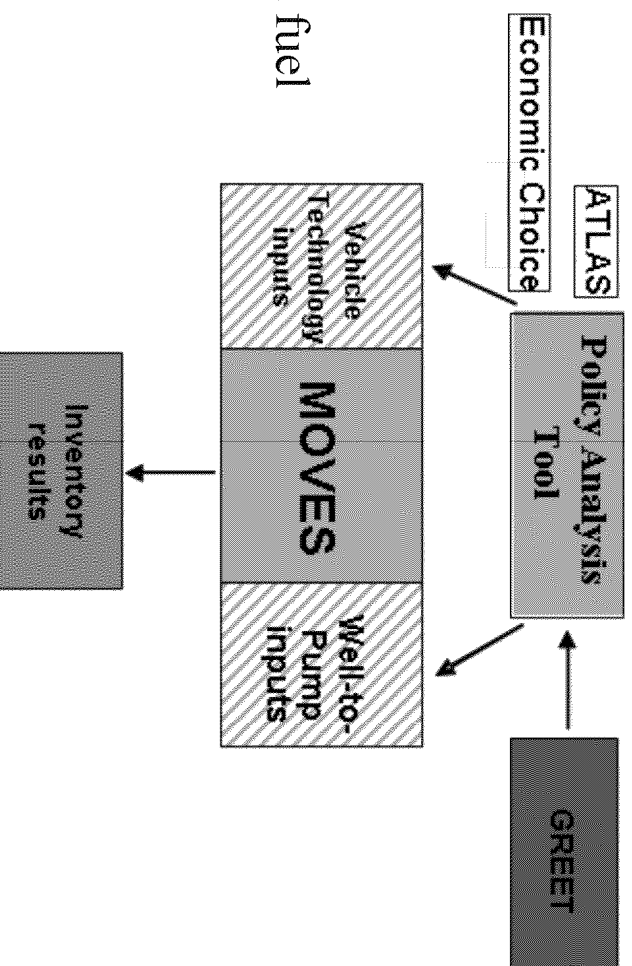
- Internal tool(s) that would link other analysis
- Designed for analysis of policy questions
 - E.g. what is the optimal vehicle and fuel mix to meet a new CAFE, AFS or tailpipe GHG standard?

Short Term

- ATLAS tool is in place for vehicle technologies, and has limited well-to-pump capability; could be broadened for scenario analysis
 - Still no connection to economic market supply/demand

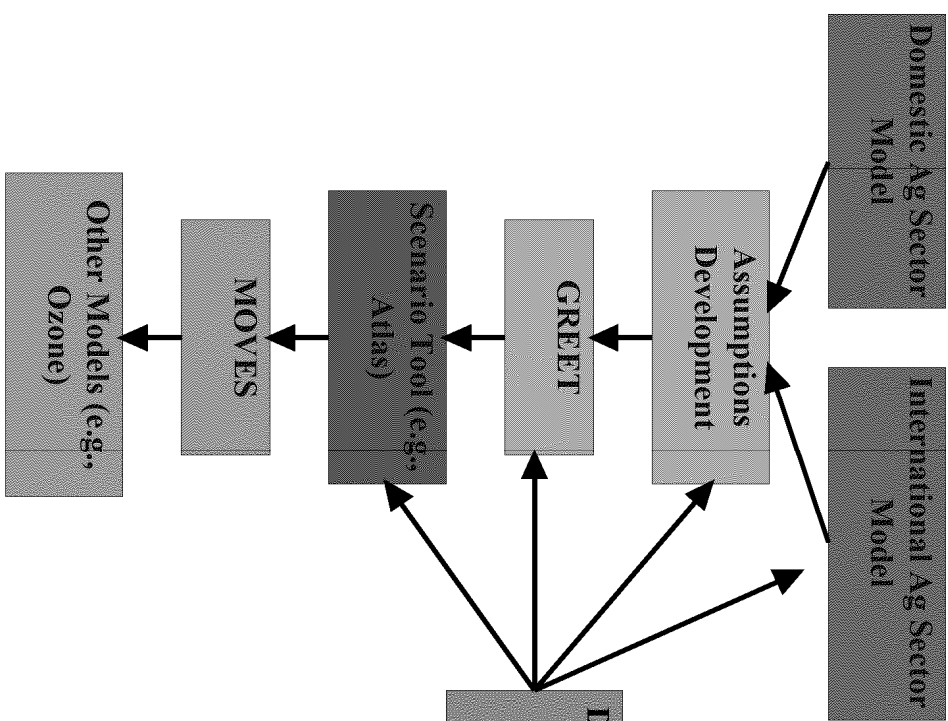
Long Term

- Economic choice model addresses economic effects of policy choices (supply/demand, effects on price etc.)

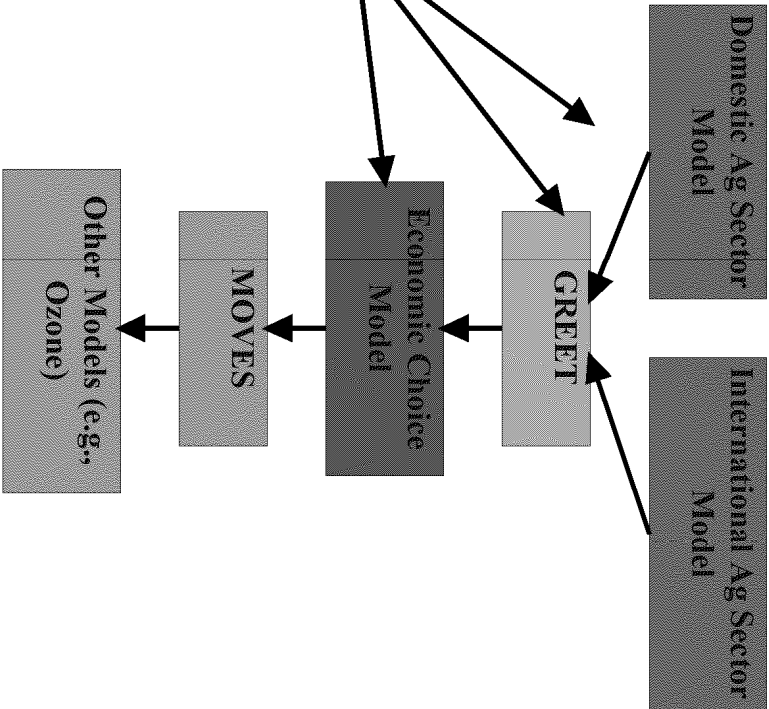


Putting it Together

Short Term



Long Term



Energy Security Analysis (\$0.2M)

- ➔ Continue developing methodologies for estimating the energy security benefits of increased alternative fuels use
 - Development of tool with Oakridge National Lab that provides energy security benefits estimates of oil reductions
 - Workshop and peer review for tool

RFS Implementation and Surveys

Implementation Needs Overview

→ RFS Implementation

- Infrastructure for processing/managing reporting parties and data
- Data analysis & trends reports
- Stakeholder and reporting party outreach and support
- State renewable survey

→ Section 1505 Implementation

- Toxicology/analytical support

2007 Budget Plan for Implementation

CDX Enhancements

Ex. 4 - CBI

- Registration maintenance tool to automatically register users, update information, and follow up on missing or incomplete information
- Improved, editable forms and user tools
- Pay.gov pilot to more efficiently handle user digital certificate costs

Stakeholder and Reporting Party Outreach and Support

Ex. 4 - CBI

- Web site enhancements to provide critical user information and web-based registration system
- Help desk to field and track routine procedural questions and resolve reporting QA/QC problems
- Workshops
- Other outreach materials (brochures, instructional DVD, etc)

Section 1505 Implementation

Ex. 4 - CBI

- Toxicology & analytical support

2008 Budget Plan for Implementation

Ongoing RFS Implementation Needs

Ex. 4 - CBI

- Statistical support
- Data trends annual report
- Miscellaneous hardware and software operational upgrades

State Renewables Survey

Ex. 4 - CBI

- *Cost range **Ex. 4 - CBI** depending on survey robustness, reliability of data, participation of external stakeholders, etc

Section 1505 Implementation

- Toxicology and statistical support

Ex. 4 - CBI

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